

NOTE TO PTO PERSONNEL:
THIS PATENT APPLICATION IS BEING
FILED WITH SMALL ENTITY STATUS

1 **MILLING CUTTER HAVING CLOSE HOLDING EFFECT**

2 **BACKGROUND OF THE INVENTION**

3 **1. Field of the Invention**

4 The present invention relates to a milling cutter, and more
5 particularly to a milling cutter having a close holding effect.

6 **2. Description of the Related Art**

7 A conventional milling cutter in accordance with the prior art shown
8 in Figs. 6-11 comprises a cutter body 10 having a cutter holder 11 formed with
9 a receiving recess 111, a cutting insert 12 mounted in the receiving recess 111
10 of the cutter holder 11 and formed with a shaft hole 121, and a locking screw
11 13 extended through the cutter holder 11 and the shaft hole 121 of the cutting
12 insert 12 to combine the cutter holder 11 and the cutting insert 12.

13 As shown in Fig. 8, the cutting insert 12 has thickness t smaller than
14 the width d of the receiving recess 111 of the cutter holder 11. Thus, the cutting
15 insert 12 is clamped in the receiving recess 111 of the cutter holder 11 by
16 elastic deformation of the distal end of the cutter holder 11.

17 As shown in Fig. 9, the cutting insert 12 is only supported by the
18 clamping force of the distal end of the cutter holder 11, so that the cutting insert
19 12 is not mounted on the cutter holder 11 rigidly and stably, thereby affecting
20 the cutting precision of the milling cutter.

21 As shown in Figs. 10 and 11, during operation of the conventional
22 milling cutter, the cutting insert 12 is subjected to a resistance "F" which

1 produces a moment "M" which produces a rotational force on the cutting insert
2 12, so that the cutting insert 12 is easily rotated by the moment "M" to change
3 its position. Thus, when the cutting insert 12 is subjected to a shearing stress,
4 the cutting size of the cutting insert 12 is easily changed, and the cutting insert
5 12 is easily broken.

6 **SUMMARY OF THE INVENTION**

7 The present invention is to mitigate and/or obviate the disadvantage
8 of the conventional milling cutter.

9 The primary objective of the present invention is to provide a milling
10 cutter having a close holding effect.

11 Another objective of the present invention is to provide a milling
12 cutter, wherein the clamping jaw of the elastic clamp is fixed in the fixing
13 groove of the cutting insert, so that the cutting insert is fixed on the cutter
14 holder by support of the clamping jaw of the elastic clamp and cannot be
15 moved axially and rotated relative to the cutter holder.

16 A further objective of the present invention is to provide a milling
17 cutter, wherein when the locking screw is screwed on the cutter holder, the
18 elastic clamp of the cutter holder is urged to move toward the fixing seat, so
19 that the clamping jaw of the elastic clamp is closely urged on the first end of
20 the cutting insert and the clamping face of the elastic clamp is closely urged on
21 a second end of the cutting insert, thereby locking the cutting insert on the
22 cutter holder rigidly and stably.

1 A further objective of the present invention is to provide a milling
2 cutter, wherein the locking screw is combined with the cutter holder and the
3 cutting insert in a close fit manner, so that the cutting insert is fixed on the
4 cutter holder by support of the locking screw and cannot be moved axially and
5 rotated relative to the cutter holder.

6 A further objective of the present invention is to provide a milling
7 cutter, wherein the cutting insert is mounted on the cutter holder rigidly and
8 stably, so that the cutting resistance applied on the cutting insert is distributed
9 on the cutter holder evenly, thereby preventing the cutting insert from being
10 worn out or broken.

11 A further objective of the present invention is to provide a milling
12 cutter, wherein the locking screw is combined with the cutter holder and the
13 cutting insert in a close fit manner, so that the cutting insert is fixed on the
14 cutter holder by support of the locking screw and cannot be moved sideward
15 relative to the cutter holder.

16 In accordance with the present invention, there is provided a milling
17 cutter, comprising a cutter body, a cutter holder secured on one end of the
18 cutter body, a cutting insert secured on the cutter holder, and a locking screw
19 extended through the cutter holder and the cutting insert to combine the cutter
20 holder and the cutting insert, wherein:

21 the cutter holder has an inside formed with a receiving recess, the
22 receiving recess of the cutter holder has a first side formed with an elastic

1 clamp and a second side formed with a fixing seat, the elastic clamp of the
2 cutter holder has a first end formed with an elongated slit, a mediate portion
3 formed with an elongated arcuate protruding clamping jaw, and a second end
4 formed with a depression formed with a clamping face; and

5 the cutting insert is mounted in the receiving recess of the cutter
6 holder and has a first end formed with an elongated arcuate fixing groove
7 mounted on the clamping jaw of the elastic clamp and a second end urged by
8 the clamping face of the elastic clamp.

9 Further benefits and advantages of the present invention will become
10 apparent after a careful reading of the detailed description with appropriate
11 reference to the accompanying drawings.

12 **BRIEF DESCRIPTION OF THE DRAWINGS**

13 Fig. 1 is an exploded perspective view of a milling cutter in
14 accordance with the preferred embodiment of the present invention;

15 Fig. 2 is a plan assembly view of the milling cutter as shown in Fig.
16 1;

17 Fig. 3 is a plan assembly view of the milling cutter as shown in Fig.
18 1;

19 Fig. 4 is a partially cross-sectional enlarged view of the milling cutter
20 as shown in Fig. 3;

21 Fig. 5 is a partially cross-sectional enlarged view of the milling cutter
22 as shown in Fig. 2;

1 Fig. 6 is an exploded perspective view of a conventional milling
2 cutter in accordance with the prior art;

3 Fig. 7 is a plan assembly view of the conventional milling cutter as
4 shown in Fig. 6;

5 Fig. 8 is a plan view of the conventional milling cutter as shown in
6 Fig. 6;

7 Fig. 9 is a partially plan enlarged view of the conventional milling
8 cutter as shown in Fig. 6;

9 Fig. 10 is a schematic operational view of the conventional milling
10 cutter as shown in Fig. 7; and

11 Fig. 11 is a schematic operational view of the conventional milling
12 cutter as shown in Fig. 7.

13 **DETAILED DESCRIPTION OF THE INVENTION**

14 Referring to the drawings and initially to Figs. 1-4, a milling cutter
15 20 in accordance with the preferred embodiment of the present invention
16 comprises a cutter body 21, a cutter holder 30 secured on one end of the cutter
17 body 21, a cutting insert 60 secured on the cutter holder 30, and a locking
18 screw 50 extended through the cutter holder 30 and the cutting insert 60 to
19 combine the cutter holder 30 and the cutting insert 60.

20 The cutter holder 30 has an inside formed with a receiving recess 31.
21 The receiving recess 31 of the cutter holder 30 has a first side formed with an
22 elastic clamp 32 and a second side formed with a fixing seat 33. The elastic

1 clamp 32 of the cutter holder 30 has a first end formed with an elongated slit
2 320 communicating with the receiving recess 31 of the cutter holder 30 so that
3 the elastic clamp 32 of the cutter holder 30 has an elastic deformation effect.
4 The elastic clamp 32 of the cutter holder 30 has a mediate portion formed with
5 an elongated arcuate protruding clamping jaw 321. The elastic clamp 32 of the
6 cutter holder 30 has a second end formed with a depression 322 formed with a
7 clamping face 323. The elastic clamp 32 of the cutter holder 30 has an inside
8 formed with a countersunk bore 42, the fixing seat 33 of the cutter holder 30
9 has an inside formed with a screw bore 41, and the cutter holder 30 is formed
10 with a support hole 43 communicating with the countersunk bore 42 and the
11 screw bore 41. Preferably, the support hole 43 of the cutter holder 30 is
12 extended to the elastic clamp 32 and the fixing seat 33.

13 The cutting insert 60 is mounted in the receiving recess 31 of the
14 cutter holder 30 and has a first end formed with an elongated arcuate fixing
15 groove 61 mounted on the clamping jaw 321 of the elastic clamp 32 and a
16 second end urged by the clamping face 323 of the elastic clamp 32. The cutting
17 insert 60 has a mediate portion formed with a through hole 62.

18 Preferably, a clearance is defined between the receiving recess 31 of
19 the cutter holder 30 and the first end of the cutting insert 60, thereby preventing
20 the cutting insert 60 from being worn out or broken.

21 In practice, the clamping jaw 321 of the elastic clamp 32 is extended
22 in a direction vertical to an axial direction of the receiving recess 31 of the

1 cutter holder 30, and the fixing groove 61 of the cutting insert 60 is extended in
2 a direction the same as that of the clamping jaw 321 of the elastic clamp 32.
3 Thus, the cutting insert 60 is sideward inserted into the receiving recess 31 of
4 the cutter holder 30, and the clamping jaw 321 of the elastic clamp 32 slides
5 into the fixing groove 61 of the cutting insert 60.

6 The locking screw 50 includes a shank 52 extended through the
7 countersunk bore 42 of the elastic clamp 32, the support hole 43 of the cutter
8 holder 30, the through hole 62 of the cutting insert 60 and the screw bore 41 of
9 the fixing seat 33, a head 51 formed on a first end of the shank 52 and fixed in
10 the countersunk bore 42 of the elastic clamp 32, and an outer thread 53 formed
11 on a second end of the shank 52 and screwed into the screw bore 41 of the
12 fixing seat 33.

13 Preferably, the head 51 of the locking screw 50 is worked by a
14 grinding process to have an exact size, and a small tolerance (about 0.01mm) is
15 defined between the head 51 of the locking screw 50 and the countersunk bore
16 42 of the elastic clamp 32. In addition, the shank 52 of the locking screw 50 is
17 worked by a grinding process to have an exact size, and a small tolerance
18 (about 0.01mm) is defined between the shank 52 of the locking screw 50 and
19 the support hole 43 of the cutter holder 30. In addition, a small tolerance (about
20 0.01mm) is defined between the shank 52 of the locking screw 50 and the
21 through hole 62 of the cutting insert 60.

1 Accordingly, the clamping jaw 321 of the elastic clamp 32 is fixed in
2 the fixing groove 61 of the cutting insert 60 as shown in Fig. 5, so that the
3 cutting insert 60 is fixed on the cutter holder 30 by support of the clamping jaw
4 321 of the elastic clamp 32 and cannot be moved axially and rotated relative to
5 the cutter holder 30.

6 In addition, when the locking screw 50 is screwed on the cutter
7 holder 30, the elastic clamp 32 of the cutter holder 30 is urged to move toward
8 the fixing seat 33, so that the clamping jaw 321 of the elastic clamp 32 is
9 closely urged on the first end of the cutting insert 60 and the clamping face 323
10 of the elastic clamp 32 is closely urged on the second end of the cutting insert
11 60 as shown in Fig. 4, thereby locking the cutting insert 60 on the cutter holder
12 30 rigidly and stably.

13 Further, the locking screw 50 is combined with the cutter holder 30
14 and the cutting insert 60 in a close fit manner, so that the cutting insert 60 is
15 fixed on the cutter holder 30 by support of the locking screw 50 and cannot be
16 moved axially and rotated relative to the cutter holder 30.

17 Further, the cutting insert 60 is mounted on the cutter holder 30
18 rigidly and stably, so that the cutting resistance applied on the cutting insert 60
19 is distributed on the cutter holder 30 evenly, thereby preventing the cutting
20 insert 60 from being worn out or broken.

21 Further, the locking screw 50 is combined with the cutter holder 30
22 and the cutting insert 60 in a close fit manner, so that the cutting insert 60 is

1 fixed on the cutter holder 30 by support of the locking screw 50 and cannot be
2 moved sideward relative to the cutter holder 30.

3 Although the invention has been explained in relation to its preferred
4 embodiment(s) as mentioned above, it is to be understood that many other
5 possible modifications and variations can be made without departing from the
6 scope of the present invention. It is, therefore, contemplated that the appended
7 claim or claims will cover such modifications and variations that fall within the
8 true scope of the invention.